Appl. No. 10/605,537
Response dated 5/17/2006
Reply to Office Action of 11/17/2005

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1-16. (canceled)

17. (currently amended) A multi-compartment microfluidic device for enabling fluidic isolation among interconnected compartments within the device comprising:

a ~~micropatterned~~ substrate coupled with an optically transparent housing;

said optically transparent housing comprising a first microfluidic region having a first plurality of entry reservoirs for accepting or extracting a first volume of fluid;

said optically transparent housing further comprising a second microfluidic region , said second microfluidic region having a second plurality of entry reservoirs for accepting or extracting a second volume of fluid that is less than said first volume of fluid to create hydrostatic pressure;

a barrier region that couples said first microfluidic region with said second microfluidic region in a way that enables a biological specimen to simultaneously extend across said first microfluidic region, said barrier region and said second microfluidic region; and

said barrier region comprising ~~at least one~~ plurality of ~~embedded~~ microgrooves having a width and height that enables said second volume of fluid to be fluidically isolated from said first volume of fluid via said hydrostatic pressure maintained via said at least one embedded microgroove.

18. (original) The multi-compartment microfluidic device of claim 17 wherein said first microfluidic region and said second microfluidic region are dispose parallel to one another and coupled with said barrier region.

19-20. (canceled)

21. (original) The multi-compartment microfluidic device of claim 17 wherein said at barrier region comprises a length of not less than 50 μm.

22. (currently amended) The multi-compartment device of claim 17 wherein at least one of said ~~at lest one embedded~~ plurality of microgrooves comprises dimensions less than 10 μm in height.

23. (original) The multi-compartment microfluidic device of claim 17 wherein said biological specimen comprises a cellular structure.

24. (original) The multi-compartment microfluidic device of claim 23 wherein said first volume of fluid is applied to a first somal domain of said cellular structure and said second volume of fluid is applied to a cytoplasmic domain of said cellular structure.

25. (original) The multi-compartment microfluidic device of claim 23 wherein said cellular structure comprises nerve cells.

26. (original) The multi-compartment microfluidic device of claim 25 wherein said first volume of fluid is applied to a first somal domain of said nerve cell and said second volume of fluid is applied to an neuritic region of said nerve cell.

27. (original) The multi-compartment microfluidic device of claim 26 wherein said first somal domain comprises a nerve cell body.

28. (original) The multi-compartment microfluidic device of claim 26 wherein said neuritic region comprises an axonal domain.

29. (original) The multi-compartment microfluidic device of claim 28 wherein said barrier region selects for said axonal domain of said neuritic region of said biological specimen by comprising a length of 400 μm or more.

30. (original) The multi-compartment microfluidic device of claim 25 wherein synapses of said nerve cell are isolated in said second microfluidic region.

31-38. (canceled)

39. (new) A multi-compartment microfluidic device for maintaining substantial fluidic isolation between interconnected compartments within the device comprising:

a substrate coupled with an optically transparent housing;

said optically transparent housing comprising:

(1) a first microfluidic region having a plurality of first reservoirs, said first microfluidic region having a first volume of fluid; and

(2) a second microfluidic region having a plurality of second reservoirs, said second microfluidic region having a second volume of fluid;

said first volume of fluid being greater than said second volume of fluid to create hydrostatic pressure at a barrier region configured to couple said first microfluidic region with said second microfluidic region, said barrier region comprising microgrooves that enable a biological specimen to extend across said first microfluidic region, said barrier region and said second microfluidic region; and

said microgrooves of said barrier region having a height lower than said first microfluidic region and said second microfluidic region, said barrier region having a width and height that enables said second volume of fluid to be fluidically isolated from said first volume of fluid by hydrostatic pressure maintained by said microgrooves.

40. (new) The microfluidic device of claim 39 wherein said first microfluidic region is more than 30 μm high and the microgrooves are less than 5 μm high.

41. (new) A method for culturing biological specimens and for observation and data collection comprising:

(a) providing a multi-compartment microfluidic device for enabling fluidic isolation among interconnected compartments within the device comprising:

a substrate coupled with an optically transparent housing;

said optically transparent housing comprising a first microfluidic region having a first entry reservoir comprising a first volume of fluid;

said optically transparent housing further comprising a second microfluidic region having a second entry reservoir comprising a second volume of fluid that is less than said first volume of fluid to create hydrostatic pressure;

a barrier region that couples said first microfluidic region with said second microfluidic region to enable a biological specimen to extend across said first microfluidic region, said barrier region and said second microfluidic region; and

said barrier region comprising at least one embedded microgroove having a width and height that enables said second volume of fluid to be fluidically isolated from said first volume of fluid via said hydrostatic pressure maintained via said at least one embedded microgroove;

(b) introducing a biological specimen into said first microfluidic region;

(c) observing growth of said biological specimen in said first microfluidic region and across said barrier region to said second microfluidic region; and

(d) collecting data based on said observations of said growth of said biological specimen.

42. (new) A method for neuronal culturing, observation and data collection comprising:

(a) providing a multi-compartment microfluidic device for enabling fluidic isolation among interconnected compartments within a device comprising:

a substrate coupled with an optically transparent housing;

said optically transparent housing comprising a first microfluidic region having a first entry reservoir for accepting a first volume of fluid;

said optically transparent housing further comprising a second microfluidic region having a second entry reservoir for accepting a second volume of fluid that is less than said first volume of fluid to generate hydrostatic pressure at a barrier region, said barrier region being coupled to said first microfluidic region and said second microfluidic region to enable a nerve cell to extend across said first microfluidic region, said barrier region and said second microfluidic region, wherein said first volume of fluid is applied to a first somal domain of said nerve cell and said second volume of fluid is applied to a neuritic region of said nerve cell; and

said first microfluidic region and said second microfluidic region being disposed substantially parallel to one another and said barrier region comprising a plurality of microgrooves having a width and height that enables said second volume of fluid to be fluidically isolated from said first volume of fluid by said hydrostatic pressure maintained by said plurality of microgrooves, said hydrostatic pressure resulting from higher resistance to flow due to said plurality of microgrooves;

(b) introducing a nerve cell into said first microfluidic region;

(c) selectively maintaining a treatment in said first and second microfluidic regions as appropriate;

(c) observing extension of said nerve cell across said barrier region to said second microfluidic region; and

(d) collecting data based on said observations of said extension of said nerve cell across said barrier region.